January 2006

Efficacy of Sunflower Decoy Plots for Blackbird Control and Supplemental Stopover Habitat

Heath M. Hagy
Department of Biological Sciences, NDSU

Jon Raetzman
Department of Biological Sciences, NDSU

George M. Linz
USDA/APHIS/WS National Wildlife Research Center, george_m_linz@yahoo.com

William J. Bleier
Department of Biological Sciences, NDSU

Efficacy of Sunflower Decoy Plots for Blackbird Control and Supplemental Stopover Habitat

Heath M. Hagy[1], Jon Raetzman[1], George M. Linz[2], William J. Bleier[1]
1. Department of Biological Sciences, NDSU, Fargo, ND 58105
2. USDA, Wildlife Services, National Wildlife Research Center, Bismarck, ND 58501

Abstract

Wildlife Conservation Sunflower Plots (WCSP) were planted and monitored during a two-year trial/research program to monitor the effect of decoy plots on blackbird use of nearby commercial sunflower and abundance of nonblackbird migratory species within the plots. In the two year evaluation period, in excess of 975 hours were spent by three researchers in the plots monitoring damage, vegetation, and avian use. We used bird numbers, vegetation characteristics, and landuse landscape variables to assess the optimal habitat conditions in and around each decoy plot for luring blackbirds and providing adequate stopover habitat for nonblackbird migrants. In 2004, wetland and shelterbelt acreages were significantly correlated to bird damage in WCSP (r^2=0.81, p=0.001, p=0.001). Avian density in WCSP was greater in both years when compared with commercial sunflower and other grain crops. Damage was also higher in WCSP than commercial sunflower and control plots. WCSP can be effective at reducing blackbird damage to commercial sunflower in some instances.

Introduction

Nearly two-thirds of North American breeding birds of the central and eastern United States migrate to wintering areas in Central and South America. Critical stopover sites along the migration route determine the success of this journey. Habitat selection of stopover patches due to forage and cover factors intrinsic to that area is undeniable (Moore and Simons 1989). Landscape that retains more natural, unfragmented, lands support a higher abundance of migrants (Flather and Sauer 1996). As anthropogenic activity, namely agriculture, in the Great Plains has virtually eliminated large tracts of unaltered native prairie, migrants must seek out small patches of suitable habitat from the mosaic of land uses present.

Special concern has been placed in relation to migratory birds since the 1950's both in the United States and overseas. Increased agriculture has lead to the availability of waste grain for those species who have adapted to use this valuable resource. Moore and Simons (1989) cite food availability as perhaps the most important constraint during long-distance migrations. It has been traditionally thought that avian use of stopover sites is strongly related to vegetation type and structure of a local area (Macarthur and Macarthur 1961, Karr 1968). Many small grains provide forage but may lack cover

sought by some migrants. Sunflower provides a nutrient rich food source for migrating avifauna and can provide shrub-like habitat for cover and loafing.

One avian species that has benefited from the expanding agriculture in the prairie pothole region (PPR) is the red-winged blackbird (*Agelaius phoeniceus*). This species uses cattails for cover and breeding purposes while feeding on commercial agriculture in the region (Hothem et al. 1988). In particular, blackbirds concentrate on ripening sunflower causing significant losses in some cases (Linz and Hanzel 1997). This behavior has adverse effects on the commercial sunflower harvest in those areas where large flocks of blackbirds congregate and can lead to significant profit loss or total field depredation for some farmers. Obvious damage and the presence of large foraging flocks of blackbirds may even serve to discourage producers from future planting sunflower in this optimal growing region. As the largest single sunflower producing state in the United States and home to abundant breeding and migrating blackbirds, North Dakota has become especially attuned to the agro-ecology of these interacting entities.

Blackbird control is a serious issue where large tracts of cattail and commercial sunflower coexist. Chemical, olfactory, auditory, habitat, and visual harassment methods have not eliminated blackbird damage to sunflower on a large scale. The promise of decoy plots for reducing bird damage, showed by Cummings et al. (1987), was revisited by ND/SD Wildlife Services biologists leading to the decoy (also lure) plot program initiated in 2004. Twenty-acre (8 hectare) decoy plots of oilseed sunflower were planted in the PPR of North Dakota in spring 2004 and 2005. The decoy plots were monitored for their potential to lure blackbirds away from commercial sunflower as well as their ability to provide critical stopover habitat for nonblackbird migrant avifauna. In this study, we sought to (1) identify and quantify bird use of sunflower and other small grain fields by fall migrating birds in North Dakota, (2) identify and quantify habitat factors that might influence bird-use of grain crop fields, especially sunflower, (3) provide baseline data on the use of Wildlife Conservation Sunflower Plots for wildlife resource managers to make informed decisions on the environmental effects and efficacy of these plantings for reducing blackbird use of commercial sunflower and providing habitat for wildlife, (4) outline WCSP placement guidelines for Wildlife Services personnel and independent farmers to maximize efficacy of these decoy plots.

Methods

We conducted point counts and vegetation measurements in east-central North Dakota from 24 August to 19 October 2004 and from 10 August to 28 October 2005. Fourteen study sites were examined in 2004 while 21 were examined in 2005 for avian abundance, density, and richness. Each study site included one 8-ha WCSP, one commercial sunflower field, and one non-sunflower grain crop field located within 2.4 km (1.5 mile) of the WCSP. Point counts were used in 2004 and 2005, while mist netting

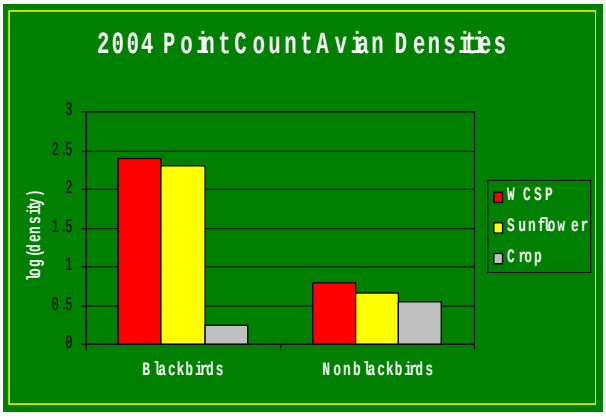
was additionally used in 2005. WCSP were planted by willing farmers who were compensated for their time, land usage, and seed expenditures.

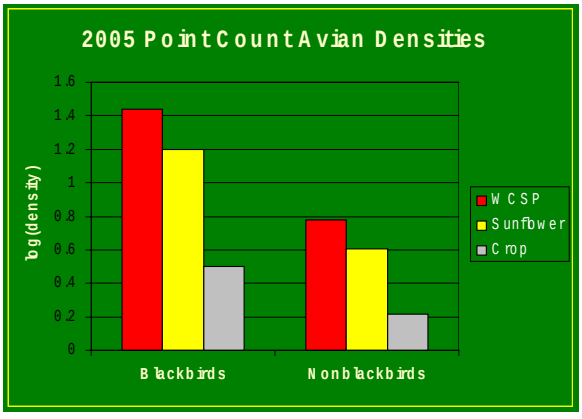
In 2004, three consecutive surveying rounds were made during the fall months. In 2005, two rounds were made as the numbers of study sites increased along with the addition of control fields. The number of visitations, or rounds, to each site were determined by the dates of sunflower maturation and subsequent harvest. Sites were surveyed in the same order between each round. Seven control fields were examined for avian abundance, both blackbird and nonblackbird, and damage. We randomly selected control fields at intervals exceeding 5 km and not within the same distance of a WCSP.

Results

Point Counts

In 2004, we counted 551 (26%) nonblackbirds within the WCSP, 851 (40%) in commercial sunflower, and 717 (34%) in other grain fields. Blackbird numbers totaled 10,473 (50%) in WCSP, 10,424 (50%) in commercial sunflower, and 73 (<1%) in all other grain crops. Of the 43 different species observed in 2004, 26 were seen in WCSP, 31 in commercial sunflower, and 21 in all other grain fields. Nonblackbird density in commercial sunflower was 4.3 birds/ha; whereas, WCSP harbored 6.2 birds/ha. Blackbird density was 200 birds/ha in commercial sunflower and 250 birds/ha in WCSP. Overall grain crop density was 3.6 birds/ha for blackbirds and 1.7 birds/ha for nonblackbirds.





In 2005, we observed 527 (35%) nonblackbirds within the WCSP, 650 (43%) in commercial sunflower, and 322 (21%) in other grains fields. Blackbird numbers totaled 2,299 (42%) in WCSP, 2,560 (46%) in commercial sunflower, and 613 (12%) in all other

grain crops. Of the 46 different species observed in 2005, 30 were seen in WCSP, 32 in commercial sunflower, and 20 in all other grain. Nonblackbird density in commercial sunflower was 4.0 birds/ha; whereas, WCSP harbored 6.1 birds/ha. Blackbird density was 13.3 birds/ha in commercial sunflower and 27.3 birds/ha in WCSP. Overall grain crop density was 3.6 birds/ha for blackbirds and 1.9 birds/ha for nonblackbirds.

Vegetation Surveys

Preliminary analysis of the vegetative data shows that plant densities, canopy cover, row width, and weedy species do not differ between WCSP and commercial sunflower.

Geospatial Analysis

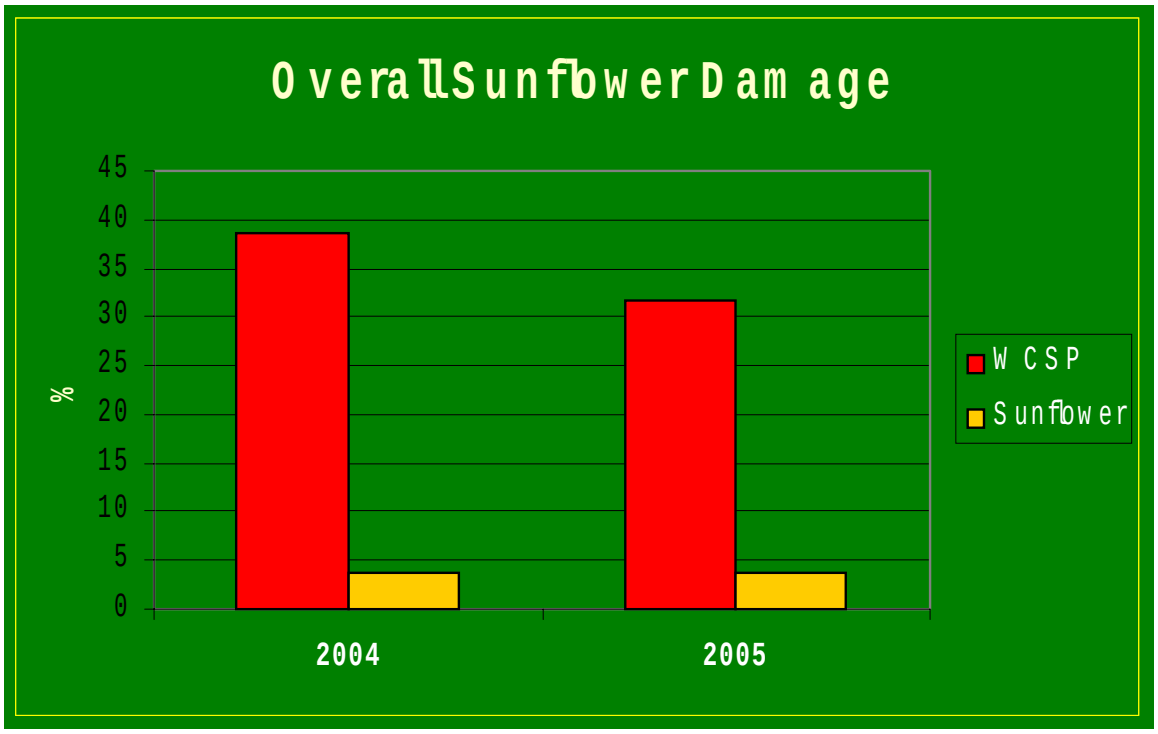
Land use data were collected and then analyzed with GIS ArcMap to determine the effect of spatial habitat variables on bird use and damage to WCSP (ESRI 2002). Using multiple linear regressions, no significant correlation was shown between damage, bird use, or land use within a 2.4 km buffer of the WCSP. However, at a 0.5 km buffer radius shelterbelt acreage ($p=0.021$), wetland acreage ($p<0.001$), and presence/absence of adjacent wetlands ($p=0.001$) were significantly correlated to damage ($r^2=0.82$). Nonblackbirds ($r^2=0.58$) were correlated to shelterbelt acreages ($p<0.001$) and wetland acreages ($p<0.001$). Blackbird numbers ($r^2=0.69$) within the WCSP were correlated to shelterbelt acreages ($p<0.001$) and damage ($p<0.001$), but not to wetlands ($p>0.171$).

Weekly Blackbird Surveys

During our weekly surveys in 2004, commercial sunflower averaged 1,813 blackbirds/field, while WCSP averaged 2,374 blackbirds/field. Over the complete 2004 field season, WCSP contained a total of approximately 33,000 blackbirds and commercial sunflower fields contained over 42,000 blackbirds. In 2005, commercial sunflower averaged 879 blackbirds/field while WCSP averaged 2,731 blackbirds/field. In 2005, there were 57,365 blackbirds in WCSP and 43,111 in commercial sunflower. In both years, the density of blackbirds per hectare was greater in WCSP than commercial sunflower.

Damage Surveys

In 2004, the 13 WCSP had a final mean percent damage of 38.6%. There were a total of 23 commercial sunflower fields within a 1.5 mile radius of the WCSP. We surveyed for damage just prior to harvest in each commercial sunflower field and found that mean damage was 4.68%. In 2005, the 21 WCSP had a final damage mean of 32.1%. There were a total of 51 commercial sunflower fields within a 1.5 mile radius of the WCSP. Final mean damage in the commercial sunflower fields was 4.2%. The damage in the control plots exceeded that in commercial sunflower associated with WCSP. Control plot damage was 10.2% in 2005.



Discussion

The WCSP harbored a higher density of both blackbirds and nonblackbird species than other crop fields. Damage and avian count methods showed higher numbers of birds/ha in the WCSP compared to commercial sunflower. The proportion of area to bird numbers was much lower in WCSP, suggesting that birds are more attracted to the WCSP than commercial sunflower and non-sunflower grain crops. Using the 10% damage threshold, all WCSP would be considered total losses negating harvest (National Sunflower Association, unpublished data). Additionally, most commercial fields associated with WCSP did not receive significant damage. Several WCSP in both years received 90% damage or greater. These fields should be used as examples to model proper decoy plot application. Initially, we support decoy plantings as a blackbird management tool and encourage their use as part of an integrated pest management / wildlife habitat system.

Within the original 1.5 mile buffer area around the conservation plots, land use and habitat variables were not significantly correlated with either damage or bird usage. However, as the buffer size around the WCSP is decreased, both wetlands and shelterbelts acreages become significant according to multiple regression analysis. Data do suggest that on a small scale, <0.5 km, land use variables become significant indicators of bird use and damage in sunflower. We recognize that small sample size within our study due to environmental conditions and monetary restraints may affect the interpretation of our results, but preliminary data suggest that decoy plots may have some damage-reducing effects on commercial fields.

We suggest that decoy plots may be helpful at reducing blackbird damage when used as part of a carefully designed integrative pest management system. This approach should include cattail management, blackbird harassment, and careful decoy plot placement. Plots should be placed between large roosts, i.e., cattail inundated wetlands, and large commercial sunflower acreages. Commercial fields should not be planted adjacent to the decoy plots so that blackbirds have an incentive to stop nearer to their roost. We do suggest that for the decoys plots to be effective, commercial fields should remain within one mile of WCSP unless there are no other prominent roosts in the area. Decoy plots should also be planted so that they mature before commercial sunflower in the area and contain more upright varieties of oilseed sunflower. A combination of baits may also improve decoy potential such as corn or other small grains incorporated within the sunflower. Planting a combination of varieties might distribute ripening time of individual plants retaining decoy potential throughout the season. We suggest the two later approaches, although we did not explicitly test them here. A combination of these methods will likely not only reduce blackbird damage to commercial sunflower, but also provide vital habitat for neotropical migrating birds and resident wildlife.

Acknowledgements

We thank ND/SD Wildlife Services and the USDA National Wildlife Research Center for their continued funding and support. We also thank NDSU graduate students and the Department of Biological Sciences for their guidance. As this study was not possible without willing growers, we thank them for their helpful suggestions and cooperation in the pilot year of this study. As most surveys were conducted on private lands not bound under the terms of the WCSP planting guidelines, we also would like to thank a host of private landowners for their willingness to cooperate and often times offer helpful suggestions.

Literature Cited

Cummings, J. L., J. L. Guarino, C. E. Knittle, and W. C. Royal, Jr. 1987. Decoy plantings for reducing blackbird damage to nearby commercial sunflower fields. Crop Protection 6(1):56-60.

Flather, C.H., and J.R. Sauer. 1996. Using landscape ecology to test hypotheses about large-scale abundance patterns in migratory birds. No. 1 Ecology 77:28-35.

Hothem, R. L., R. W. Dehaven, and S. D. Fairaizl. 1988. Bird damage to sunflower in North Dakota, South Dakota and Minnesota, 1979-1981. U.S. Fish and Wildlife Service Technical Report 15.

Karr, J. R. 1968. Habitat and avian diversity on strip-mined land in east-central Illinois. Condor 70:348-357.

Linz, G. M., and J. J. Hanzel. 1997. Birds and Sunflower. Sunflower Technology and Production 381-394.

MacArthur, R.H., and J.W. MacArthur. 1961. On bird species diversity. Ecology 42:594-598.

Moore, F.R. and T.R. Simons. 1992. Habitat suitability and stopover ecology of Neotropical landbird migrants. pages 345-355 in J.M. Hagan and D.W. Johnson, eds., Ecology and Conservation of Neotropical Migrant Landbirds. Smithsonian Institution Press, Washington D.C. pp. 609.